TB/HIV INTEGRATION AT PRIMARY CARE LEVEL: A QUANTITATIVE ASSESSMENT AT THREE CLINICS IN JOHANNESBURG, SOUTH AFRICA

By

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ABSTRACT

LIESL PAGE-SHIPP: TB/HIV integration at primary care level: a quantitative assessment at three clinics in Johannesburg, South Africa
(Under the direction of Prof Annelies van Rie and Ms Lori Evarts)

In 2004 the WHO released the *Interim Policy on Collaborative TB/HIV activity.* Implementation in South Africa and globally remains sub-optimal. We quantified TB/HIV integration at three primary health care clinics in Johannesburg, South Africa by retrospectively reviewing routinely collected data. Of 1104 people receiving HIV testing, 306 (28%) were HIV positive, only 57% had a CD4 count, few received TB screening or Isoniazid preventive therapy. Among HIV positive clinic encounters, 921 (15%) had documented TB symptoms, but only 10% were microbiologically assessed, and few asymptomatic patients were offered IPT. Infection control was poorly documented and implemented. Among 208 TB patients, 155 (75%) had documented HIV status, 90% were HIV positive and 88% had a documented CD4 count. Provision of CPT and ART was poorly documented. The lack of standardized recording tools and incomplete documentation impeded assessment at facility level, and limits the accuracy of data compiled at district level.

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LIST OF ABBREVIATIONS

ART	Antiretroviral treatment
ART-LINC	ART in Lower Income Countries
CHWs	Community Health Workers
CPT	Cotrimoxazole preventive therapy
DOH	Department of Health
HCT	HIV counseling and testing
HCW	Health-care workers
ICF	Intensified TB case-finding
IeDEA	International Epidemiological Databases to Evaluate AIDS
IPT	Isoniazid preventive therapy
NDOH	South African National Department of Health
NGO	Nongovernmental organization
PIT	Provider Initiated HIV testing
PLWH	People living with HIV
TB	Tuberculosis
TST	Tuberculin Skin Test
WHO	World Health Organization
WHO 3Is	Intensified TB case-finding (ICF), Isoniazid preventive therapy (IPT), and Infection control in health care and congregate settings
XDR-TB	Extensively drug-resistant TB

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Abstract

Objective

In 2004 the WHO released the *Interim Policy on Collaborative TB/HIV activities.* For People living with HIV (PLWH), activities include intensified case finding, isoniazid preventive therapy (IPT) and infection control. For TB patients, activities include HIV counseling and testing (HCT), prevention messages, and cotrimoxazole preventive therapy (CPT); care and support, and antiretroviral treatment (ART) for those with HIV-associated TB. Implementation of collaborative activities in South Africa and globally remains sub-optimal. We aimed to quantify TB/HIV integration at three primary health care clinics in Johannesburg, South Africa.

Methods

Routinely collected TB and HIV data from the HCT register, TB suspect register, TB treatment register, clinic file and HIV electronic database collected over a period of three months was reviewed.

Results

Of 1104 people receiving HCT, 306 (28%) were HIV positive, only 57% of these had a CD4 count, few were screened for TB or offered IPT. Among all clinic encounters with PLWH, 921 (15%) had documented TB symptoms, but only 10% were assessed by smear microscopy, and few asymptomatic PLWH were offered IPT. Infection control was poorly documented and implemented. Among 208 TB patients, 155 (75%) had documented HIV status, of which 90% were HIV positive and 88% had a documented CD4 count. Provision of CPT and ART was poorly documented.

Conclusion

Coverage of most TB/HIV collaborative activities was below global plan targets. The lack of standardized recording tools and incomplete documentation impeded assessment at facility level, and limits the accuracy of data compiled at district level.

3-6 Key words Integration, PLWH, diagnosis, guidelines, WHO

INTRODUCTION

HIV-associated tuberculosis (TB) continues to pose an important global public health threat. In 2010, 1.1 million (13%) of the 8.8 million new TB cases globally were among people living with HIV (PLWH) and HIV accounted for 25% of the 1.4 million TB deaths. South Africa ranked third in the number of incident TB cases in 2010 with an estimated 61% of TB patients living with HIV. Despite important efforts to curb the TB epidemic, South Africa was the only high-burden country where the TB burden continued to rise in 2010 (WHO, 2011).

To address the HIV-associated TB epidemic, the World Health Organization (WHO) published the *Interim Policy on Collaborative TB/HIV activities* in 2004 (Stop TB Department and Department of HIV / AIDS, 2004). To decrease the burden of TB in PLWH**,** the guidelines recommend intensified TB case-finding (ICF), isoniazid preventive therapy (IPT), and infection control in health care and congregate settings. In 2008, these activities were packaged as the "3Is" (WHO 3Is). To decrease the burden of HIV in TB patients, the guidelines promote HIV counselling and testing (HCT) and HIV prevention methods for all TB patients, and cotrimoxazole preventive therapy (CPT) and HIV/AIDS care and support including antiretroviral treatment (ART) for those coinfected.

Despite an increasing body of evidence (Harries, Zachariah, & Lawn, 2009); Hoffmann et al.,2010) on the effectiveness and feasibility of collaborative TB/HIV activities and recent improvements in TB/HIV integration, implementation remains below targets (WHO, 2011a). In 2010, 58% of PLWH were screened for symptoms of TB, and 12% of those eligible started IPT. Globally 34% TB patients knew their HIV status, of which 23% were HIV positive. Almost 80% of TB patients living with HIV received CPT, and 46% were on ART (WHO,2011). Only 52% of all countries implemented infection control training; data on TB infection among health care workers was not yet available (WHO, 2011).

We reviewed routine TB and HIV data to quantify TB/HIV integration at three primary health care clinics in Johannesburg, South Africa.

METHODS

Study setting and population

Three primary health care clinics in the Johannesburg metropolitan area were purposefully selected to represent different geographical catchment areas and non-governmental and Department of Health clinics. All clinics provide TB diagnosis and treatment services, HCT, pre-ART care, and continuation of ART for stable patients; two sites also initiated ART. TB and HIV services were performed vertically in different areas of the clinic by different staff who self-identified as either “HIV” or “TB” staff.

Voluntary counselling and testing was performed in those who requested this service, and provider-initiated HCT was offered to pregnant women and clients with symptoms of AIDS, including TB and sexually transmitted diseases. CPT was indicated in PLWH with CD4 count < 200 cells/mm^3, symptomatic HIV disease and all TB patients (South African National Department of Health, 2008). PLWH eligible for ART were those with CD4 count < 200 cells/mm^3 and/or WHO stage 4 disease (South African National Department of Health, 2004). PLWH were eligible for IPT if they were asymptomatic for TB and had a positive tuberculin skin test or were a TB contact (South African National Department of Health, 2008). Clinic clients with cough for more than 2 weeks were considered TB suspects, independent of HIV status. The first line diagnostic for TB was smear microscopy; and guidelines indicated that smear negative TB suspects should be further assessed by culture and chest X-ray(South African National Department of Health, 2008).Sputum analysis was performed at the centralized National Health Laboratory Services. Clients were referred to the closest hospital for chest X-ray.

All clinic clients who presented to one of the three selected clinics between 19 August and 19 October 2009 and received TB and/or HIV services were included in the analysis. Eligible clinic clients were identified by review of relevant data sources, including the paper South African National Department of Health (NDOH) HCT register, TB Case identification and follow up register and TB treatment register and an electronic HIV database (TherapyEdge Inc., Littleton, Massachusetts, USA) (Table 1). Records of all eligible individuals were reviewed 2 months after their clinic visit to allow sufficient time for activities to be performed and results to be captured. Infection control was

assessed using a standardised Risk Assessment Tool developed by the USAID Tuberculosis Project. This tool is based on the National TB Infection control guidelines (South African National Department of Health, 2007) and includes quantitative and qualitative assessments of administrative and environmental controls and personal protective equipment.

In the analysis, individuals were categorized as “HCT client” if they received HCT during the study period, “TB suspect“ if they had a diagnostic sputum investigation recorded, and “TB patient” if they were started on TB treatment during the study period. Because the WHO guidelines recommend symptom screening at every clinic visit, we included all PLWH encounters, including multiple encounters by individual PLWH that occurred during the specified time period.

Clinic records from clients who newly tested HIV positive were reviewed for documentation of TB symptom screening and their names were cross-checked with the “TB Detection and Follow up Sputum Register” to assess if a sputum specimen was obtained. Data on PLWH was extracted from the TherapyEdge database. For every encounter registered, the record of symptoms and signs was reviewed. For every PLWH with any cough, night sweats, weight loss, axillary nodules and fever recorded, the “TB Detection and Follow up Sputum Register” was cross-checked to assess if a sputum specimen was obtained. Clinic files of clients entered into the TB Case Identification and Follow up Register and/or the TB register were reviewed for HIV testing, CD4 count, CPT status and ART status.

All data from standardised NDOH registers and TherapyEdge were entered for analysis in eMuM® (Geomed, Stellenbosch, South Africa), a TB/HIV electronic clinic and patient management program. Descriptive statistics were used to characterize the study population. SAS (version 9.2, SAS, Inc., Cary, NC, USA) was used for analysis.

Study approval was granted by the Human Research Ethics Committee, University of Witwatersrand; the Institutional Review Board, University of North Carolina; City of Johannesburg Health Department; and facility managers.

RESULTS

Activities to reduce the burden of TB among PLWH

HCT clients were young (median age 27 years) and predominantly female (75%). Of the 1104 clients tested, 306 (28%) were HIV-positive. Only 57% of HIV positive patients had a CD4 count result recorded, with a median count of 336 cells/mm^3 (IQR: 152-502). The proportion of clients newly diagnosed with HIV who were screened for TB symptoms could not be determined, as this activity was not systematically recorded. Based on review of the TB case identification register, only 2 of the 306 (0.6%) HIV-positive HCT clients were assessed by smear microscopy at the time of their HCT visit.

There were 6157 clinic encounters for 4079 individual PLWH. The majority (79%) were for patients on ART (Table 2). The proportion of individuals with any recorded TB symptom of any duration was slightly higher for pre-ART than ART visits (17% vs. 14%, p=0.04). In both populations, cough was the most frequently recorded symptom (85% and 70%). Of the 921 clinic encounters with TB symptoms documented, only 91 (10%) resulted in sputum being collected, with similar proportions of pre-ART and ART suspects being investigated (12% and 9%, respectively, p=0.20). Among the 91 TB suspects investigated, 8 smear positive pulmonary TB cases and 9 smear negative culture positive TB cases were diagnosed. A culture result was missing or contaminated in 27% (22/83) of smear negative TB suspects.

The clinics did not collect information on IPT in an IPT register, pre-ART register or in the electronic HIV system, making an accurate estimate of the number of people on IPT difficult. According to the clinic directors, a small number of PLWH received IPT in one clinic; the other two clinics did not provide IPT.

An infection control plan existed in two sites, and posters on cough hygiene were displayed in all three facilities. Staff training was ad-hoc, management reported that an effort was made to educate staff on TB and encourage them to know their HIV status and seek appropriate care. There was no triage system or fast-tracking of coughing patients. Environmental controls were inconsistently used, 30% of windows remained closed. One site had UV lights in the TB clinic area. Personal

protection for staff interacting with patients in the form of N95 respirator or surgical masks was available at one clinic but use was not enforced. TB disease in health care workers was not documented.

Activities to reduce the burden of HIV among TB patients

Among the 602 TB suspects, 173 (29%) were known HIV positive before their suspect visit but only half had documentation of receiving HIV care (Table 3). Among the 429 TB suspects with unknown HIV status, half 217, (51%) had a record of HCT offer. Of these, 51% (110) were HIV positive, 20% (43) were HIV negative, and 29% (64) refused HIV testing. Overall, the proportion of TB suspects for whom the HIV status was recorded was 54%, with 73% (95% CI: 0.83, 0.90) HIV infected.

A CD4 cell count was documented in 78% (222/283) of HIV-positive TB suspects, The proportion of suspects staged by CD4 cell count and the median CD4 count did not differ significantly between those with known status at time of presentation and those tested on the day of the TB suspect visit [76% vs. 82%, respectively, p=0.27; and 190 (IQR: 90, 351) vs. 183 (IQR: 61, 289) cells/mm^3, respectively].

Among the 602 TB suspects, 143 (24%) were diagnosed with active TB: 80 (56%) with smear positive TB, 25 (17%) with smear negative, culture positive TB, 27 (19%) based on clinical and/or radiological criteria, and 11 (8%) with extrapulmonary TB. Among the 494 smear negative TB suspects, a culture was requested in 345 (70%). The culture was positive for *Mycobacterium tuberculosis* in 5%, negative in 48%, and missing in 17%. Only 81% (65/80) of TB suspects positive on smear microscopy and 26% (7/27) of smear-negative suspects with a positive culture-positive initiated TB treatment.

During the three-month study period, 208 patients received TB treatment; the majority (81%) for pulmonary TB. The proportion of TB patients aware of their HIV status increased from 39% before the TB diagnosis to 66% at time of TB treatment initiation to 75% during TB treatment (Figure 1). Among the 155 TB patients with known HIV status, 90% were HIV positive. Almost all (88%) HIV

positive TB patients had a documented CD4 cell count. Median CD4 cell count was 131 cells /mm^3 (IQR: 60-235), of which the vast majority (107/123, 87%) had a CD4 count below 350 cells/mm^3. There was no documentation of HIV prevention counseling for HIV positive or HIV negative patients, but condoms were freely available at all there clinics. According to the staff, most HIV-positive TB patients received CPT but the proportion on CPT could not be quantified as this was not documented in the TB register and not consistently recorded in the patient files. Information on ART status was not consistently recorded, and patients receiving TB treatment at a clinic not accredited for ART initiation may have initiated ART in another facility, making accurate reporting of the proportion receiving ART impossible.

DISCUSSION

In this quantitative evaluation of collaborative TB/HIV activities at three primary care clinics, we confirmed the magnitude of the TB/HIV epidemic and observed strengths and gaps in the fight against TB/HIV at primary care level, but were challenged by the weaknesses in the routine data required to report on WHO core indicators developed to monitor TB/HIV activities.

While 1104 people received HCT during the three-month period, this activity occurred in relative isolation, as people newly diagnosed with HIV were not routinely screened for TB symptoms, were not offered IPT, and only 57% had a CD4 count recorded. Howard et al. demonstrated that a simple TB symptom screen can be successfully integrated into primary health care.(Howard & El-Sadr, 2010) Among those with a recorded CD4 count, the median CD4 count was 336 cells/mm^3, higher than the median CD4 count of 111 cells/mm^3 recorded in four large ART cohorts in sub-Saharan Africa (May et al., 2010). Strengthening pre-ART programmes could thus provide an excellent opportunity to improve TB/HIV prevention efforts.

In contrast to the paper-based recording of HCT, clinic visits for PLWH were recorded electronically. Clinical symptoms were not collected as part of a formalised TB screening assessment and health care workers rarely acted upon the information, with only 10% of those symptomatic assessed by microscopy and few asymptomatic PLWH initiating IPT. The WHO recommends that the

TB screening outcome is recorded on the pre-ART or ART register as “no signs”, “suspect”, “on treatment” or “not assessed” (Stop TB Department and Department of HIV/AIDS, 2009). Even if recorded appropriately, the indicator “percentage of HIV-positive patients screened for TB in HIV care or treatment settings” does not reveal whether those identified as suspects are investigated for TB. Addition of an indicator “Proportion of symptomatic PLWH assessed for TB” may be useful as this indicator will bridge the monitoring gap between TB symptom screening and TB treatment initiation. Despite the clear benefits (Akolo, Adetifa, Shepperd, & Volmink, 2010) implementation of IPT has been very slow due to the complicated logistics of tuberculin skin testing (Getahun et al., 2010), difficulty in excluding TB, and concern of inducing INH resistance (Ait-Khaled et al., 2009). IPT was not offered at all in two and infrequently at one clinic.

While some steps were taken towards infection control, there was much room for improvement. The use of a standardised risk assessment tool on a quarterly basis will facilitate monitoring of improvements in infection control. Globally, there is no data on the proportion of health-care facilities providing services for PLWH that have TB infection control practices (indicator B.3.1) or the proportion of health care workers who developed TB (indicator B.3.2) (Stop TB Department and Department of HIV/AIDS, 2009).

Similar to global trends, the coverage of activities to reduce the burden of HIV among people with TB was higher than the coverage of the 3I’s. A high proportion (75%) of TB patients knew their HIV status**,** and 90% were HIV positive. The majority (88%) had a CD4 count documented but ART and CPT coverage could not be established as this information was erratically recorded. We observed a high (73%) prevalence of HIV among the 54% of TB suspects with documented HIV status. High HIV prevalence among TB suspects has also been reported in other settings (Odhiambo et al., 2008; Munthali, Mwaungulu, Munthali, Bowie, & Crampin, 2006) and supports the expansion of HCT recommendations to include TB suspects. Monitoring this activity would however require the revision of the TB Case identification and follow up register. The finding that 17% of culture results were missing points not only to a waste of precious resources but also to quality of TB services. The introduction of more sensitive TB diagnostic tools with the potential for use at point of care such as

Xpert MTB/RIF(Boehme et al., 2011), and LAM assay (Lawn, Kerkhoff & Vogt, 2011) could improve this situation.

While many have discussed the challenges of TB/HIV integration (Harries, Zachariah & Lawn, 2009; Howard & El-Sadr, 2010 ; Dong et al., 2007; Perumal, Padayatchi, & Stiefvater, 2009) little is known about coverage of the different components at facility level. Most data on TB/HIV integration is aggregated at country level, and accurate reporting is complicated by the existence of two vertical programmes (Gunneberg, Reid, Williams, Floyd, & Nunn, 2008.) The lack of standard documentation of most activities, and the need to cross check multiple paper-based registers, resulted in a significantly more challenging and time consuming assessment than anticipated, occupying three full time data staff for 6-months to collect data on 3 months of activities in three clinics. Two other quantitative assessments have been published. In 2000-2002, Coetzee et al. observed many missed opportunities for TB and HIV prevention, diagnosis and management at primary care clinics in Khayelitsha, South Africa (Coetzee, Hilderbrand, Goemaere, Matthys, & Boelaert, 2004). In 2006, Scott et al. audited TB/HIV integration at sixteen clinics in Cape Town, South Africa, using a rapid (2 hour per clinic) audit tool and found poor capacity and weaknesses in quality and continuity of care (Scott, Chopra, Azevedo, Caldwell, Naidoo & Smuts, 2010).

Despite the strengths of our comprehensive review of data on a large number of clinic clients, the study suffered from important limitations. First, in order to assess routine care, data collection was retrospective; consequently activities that were performed but not recorded could not be assessed. Second, clients may have received some care at other clinics but due to the high number of clinics (n=90) in the City of Johannesburg, we were unable to verify this. Third, data was only reviewed on adult clinic clients; an assessment of TB/HIV activities in children would have been complementary. Finally, South Africa underwent significant policy changes regarding collaborative TB/HIV in 2010. ART eligibility changed to a CD4 count < 350 cells/ mm^3 for TB patients and pregnant women, and all MDR-TB patients regardless of CD4 count. The revised IPT guidelines removed the need for TST and included patients with previous TB and those on ART. When contacted in February 2012, two clinic managers reported an increase in IPT uptake but could not provide an exact number of clients

initiated on IPT in 2010. IPT was not yet implemented in the third clinic. These observations highlight the slow implementation of guidelines and the continued lack of standardized documentation of IPT.

In conclusion, despite the existence of effective interventions, clear policies and guidelines, the TB/HIV epidemic continues to rage. It is encouraging that most TB/HIV activities were implemented at the primary care clinics, but unfortunately at coverage levels well below the Global Plan targets (Table 4)(WHO, 2011). This highlights the vast number of opportunities to improve HIV care and TB control as we move towards meaningful TB/HIV integration. The poor quality of routine data was of concern, especially given that primary care clinics are expected to compile data from these sources to report to district and national level for aggregation, analysis, dissemination and management of the TB and HIV programs. Collection of TB/HIV collaborative data can be complicated by privacy concerns (Loveday & Zweigenthal, 2011), the need to share data between two vertical programmes, and the lack of investment in monitoring and evaluation tools (Gunneberg, , Reid, Williams, Floyd & Nunn, 2008). Accurate monitoring of TB/HIV activities at all levels (facility, district, national, global) requires rationalization and standardization (Loveday & Zweigenthal, 2011)- (Harries AD, Zachariah R, Corbett EL, 2010), with appropriate treatment cards, registers, cohort reporting forms, and supportive supervision.(Stop TB Department and Department of HIV/AIDS, 2009 ; Harries et al.,2010). Implementation of integrated TB/HIV electronic data collection and clinic management tools, have the potential to galvanize TB/HIV integration at primary care level. We need to ensure every action is properly recorded and every loop is closed from diagnosis to treatment of HIV and TB, resulting in fully integrated TB/HIV patient care.

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Table 1: Definition of study participants, data sources and activities reviewed at 3 primary care clinics in Johannesburg, South Africa

	Definition	Source	TB and HIV activities performed	# Reviewed during study
HCT clients	Clinic clients with record of HIV test	HCT register Medical file	Intensified TB screening Staging by CD4 count	1104
PLWH encounters	Clinic visits by PLWH	Electronic HIV database TB case identification register	Intensified TB screening Referral for TB investigation if symptomatic	6157
TB suspects	Clinic client with record of diagnostic sputum investigation	TB case identification register HCT register Medical file	Diagnostics assessment of TB suspect HCT CPT and ART if eligible	602
TB patients starting TB treatment	Clinic client with TB start date during the study period	TB treatment register TB clinic file	HCT CPT Staging by CD4 count ART if eligible	208

HCT HIV counselling and testing

PLWH People Living with HIV

CPT Cotrimoxazole preventive therapy

ART Antiretroviral Treatment

Table 2: Intensified TB case finding among during 6157 clinic encounters among 4079 individual PLWH at 3 primary care clinics in Johannesburg, South Africa

	All	Pre-ART	ART	P value
	n (%)	n (%)	n (%)	
Total	6157 (100%)	1274 (21%)	4883 (79%)	
Any TB symptom recorded*	921 (15%)	214 (17%)	707 (14%)	0.04
Cough	678 (74%)	181 (85%)	497 (70%)	
Weight loss	138 (15%)	38 (18%)	100 (14%)	
Night sweats	169 (18%)	27 (13%)	142 (20%)	
Lymphadenopathy	79 (9%)	14 (7%)	65 (9%)	
Fever	58 (6%)	14 (7%)	44 (6%)	
If symptomatic, investigated for TB	91 (10%)	26 (12%)	65 (9%)	0.20
Smear-positive	8 (9%)	2 (8%)	6 (9%)	
Smear-negative, culture-negative	52 (57%)	17 (65%)	35 (54%)	
Smear-negative, culture-positive	9 (10%)	1 (4%)	8 (12%)	
Smear-negative, culture missing/ contaminated	22 (24%)	6 (23%)	16 (25%)	

*Patients may have reported more than one symptom

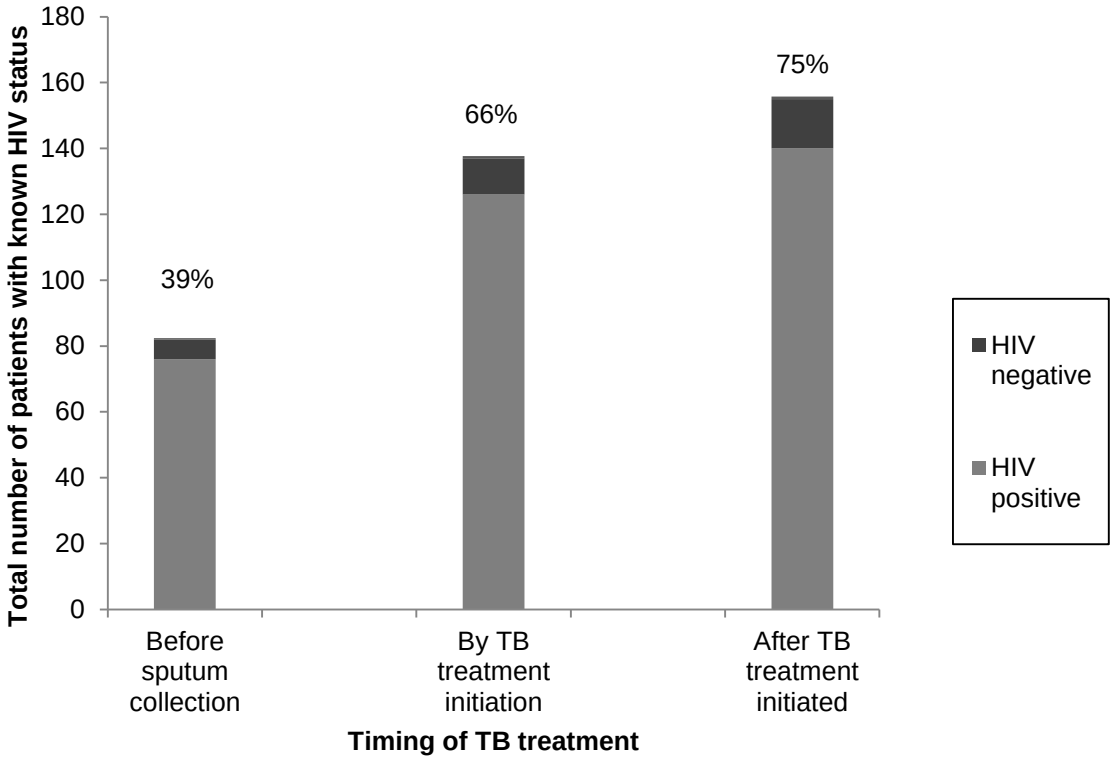
Table 3: HIV activities recorded among 602 TB Suspects at 3 primary care clinics in Johannesburg, South Africa

	n (%)
HIV counselling and testing	
Known HIV positive before TB suspect visit	173 (29%)
Referred from pre-ART care	26 (15%)
Referred from ART clinic	65 (38%)
No documentation of HIV care	80 (46%)
HCT at time of TB suspect visit (if unknown HIV status)	
Record of HIV counselling and/or testing	217 (51%)
HIV positive	110 (51%)
HIV negative	43 (20%)
HIV testing offered but refused	64 (29%)
No record of HIV counselling or testing	212 (49%)
TB suspects with documented HIV status at end of TB suspect visit	326 (54%)
HIV prevalence rate among TB suspects with recorded HIV status (95% CI)	73% (0.83, 0.90)
Staging by CD4 count	
Recorded CD4 count result	
Known HIV positive before TB suspect visit	132 (76%)
Newly diagnosed HIV infection at time of TB suspect visit	90 (82%)
Median CD4 count in cells/mm^3 (IQR)	
Known HIV positive before TB suspect visit	190 (90, 351)
Newly diagnosed HIV infection at time of TB suspect visit	183 (61, 289)

Table 4: Coverage of TB/HIV activities at 3 primary care clinics in Johannesburg, South Africa compared to 2010 estimates for South Africa and The Global Plan to Stop TB targets

Indicator(Stop TB Department and Department of HIV/AIDS, 2009)	Global Plan Target 2011-2015(WHO, n.d.)	South Africa (WHO, 2011a)	3 primary care clinics in Johannesburg
Percentage of HIV-positive patients who were screened for TB in HIV care and treatment settings (indicator B.1.1)	100%	758 837	• Not recorded at HCT • 100% of PLWH in care screened for TB symptoms • 10% of TB suspects assessed by smear microscopy
Percentage of new HIV-positive patients starting IPT (indicator B.2.1)	100%	124 059 (12%)	• 0% at 2 clinics • Small proportion at 1 clinic
Proportion of health care facilities providing services for people living with HIV that have infection control practices that include TB control (indicator B.3.1)	Target not set but 100% implied	NR	None of the clinics satisfied the requirements for indicator B.3.1.
Proportion of health-care workers, employed in facilities providing care for people living with HIV, who developed TB (indicator B.3.2)	Equal to background rate	NR	Not recorded
Proportion of TB patients with known HIV status (indicator C.1.1)	100%	54%	75%
Proportion of all registered TB patients who had documented HIV status who are HIV positive (indicator C.1.2.1)	NA	60%	90%
Availability of free condoms at TB services (indicator C.2.1)	100%	NR	100%
Proportion of HIV-positive TB patients who receive CPT (indicator C.3.1)	100%	74%	High according to HCW but poorly documented
Proportion of HIV-positive TB patients enrolled in HIV care services during TB treatment (indicator C.4.1)	100%	NR	Poorly documented
Proportion of HIV-positive registered TB patients given ART during TB treatment (indicator C.5.1)	100%	54%	Poorly documented

Fig 1: HIV counseling and testing among 208 TB patients registered at three primary care clinics in Johannesburg, South Africa



Addendum # 1: Introduction

Overview of Specific TB/HIV integration activities

The WHO *Interim Policy on Collaborative TB/HIV activities* describes TB/HIV integration in terms of decreasing the burden of TB in People Living with HIV (PLWH) and decreasing the burden of HIV in TB patients (Stop TB Department and Department of HIV / AIDS, 2004). The WHO annual report details the provision of integrated TB and HIV activities at a global and country level to measure the progress of TB/HIV integration (WHO, 2011).

Decreasing the burden of TB in People Living with HIV

The WHO described the "3Is" of decreasing TB burden in PLWH as Intensified case finding (ICF), Isoniazid Preventive Therapy (IPT) and TB infection control in health care facilities and congregate settings.

Intensified Case Finding refers to actively screening for signs of TB in areas where HIV patients congregate. It is recognised that early identification of TB and prompt initiation of treatment increases the chances of survival, improves quality of life and reduces transmission of tuberculosis in the community (Stop TB Department and Department of HIV / AIDS, 2004).

The TB symptom screen used for ICF was not previously standardised and different symptoms and their duration were used; ranging from only screening for "cough" to screening for over eight TB symptoms. Getahun et al performed an individual participant data meta-analysis of 12 Observational Studies to develop a standardised TB screening tool (Getahun et al., 2011).The findings of this meta-analysis were that absence of all of current cough, fever, night sweats, and weight loss can identify a subset of people living with HIV who have a very low probability of having TB disease. Thus a simplified screening rule using

any one of these symptoms is now recommended to identify PLWH in resource-constrained settings who require further diagnostic assessment for TB (Getahun et al., 2011).

This standardised screen will assist in simplifying the process for health-care workers (HCWs) and, if implemented consistently and documented accurately, will enable more accurate data collection and comparison.

Despite the relative simplicity and low cost of TB symptom screening, screening was only provided for 27% PLWH globally in 2007 (WHO, 2009). This increased significantly to 3 million (58%) PLWH receiving a TB symptom screen in 2010 (WHO, 2011). The increase was especially noted in South Africa where 758 837 PLWH received a TB symptom screen in 2010 (WHO, 2011).

Not only is TB symptom screening key to detecting PLWH who require further investigation to exclude TB; but absence of these 4 symptoms is the first step in assessing eligibility for ***Isoniazid Preventive Therapy*** (Stop TB Department and Department of HIV/AIDS, 2011)***.*** IPT is the provision of a single daily dose (5mg/kg/day, max 300mg/day) of Isoniazid (INH); one of the four drugs used to treat TB, for 6-9 months. The efficacy of IPT in reducing active TB was confirmed as early as 2004 in a Cochrane review of 11 trials which included 8 130 randomised participants; this benefit was found to be more significant in TST (Tuberculin Skin Test) positive individuals (Volmink & Woldehanna, 2004). A review was repeated in 2010, confirming these results (Akolo et al., 2010).

Despite clear international and local guidelines; IPT implementation has been very slow, in 2007 less than 0.1% eligible patients initiated IPT globally and only 1.5% in South Africa (WHO, 2009). Encouraging results are starting to emerge however as global implementation has started to increase; 178 144 (12%) of eligible patients started on IPT in 2010 (WHO, 2011). In South Africa, this improvement was also marked with 124 059 PLWH initiating IPT in 2010, representing a five-fold increase in IPT provision since 2009 (WHO, 2011).

In an effort to understand why the implementation of provision of a single, relatively non-toxic drug for a limited period remains poor, a number of research studies have been undertaken to explore barriers to IPT implementation. Barriers identified include the complicated logistics of tuberculin skin testing, implementation requires well trained staff, and interpretation of the result requires thorough experience and repeated visits by the patient (Getahun et al., 2010).

Although studies have consistently shown reduced efficacy of IPT in tuberculin skin test negative individuals (Akolo et al., 2010 ; Samandari et al., 2011) the requirement for TST is a barrier to implementation. In the THRio study, one third of patients developed TB before the test could be performed (Golub et al., 2010). Local and international guidelines thus no longer require a TST as a component of the eligibility criteria for IPT initiation (Stop TB Department and Department of HIV/AIDS, 2011 ; South African National Department of Health, 2010).

Other barriers to IPT implementation include HCW lack of knowledge and experience, concern regarding the accurate exclusion of TB (Lester et al., 2010), fears of inducing INH resistance (van Halsema et al., 2010) and confusion regarding IPT provision with ART (Lester et al., 2010).

Although trials to assess the efficacy of IPT once patients are on ART have been retrospective (Golub et al., 2009; Charalambous et al., 2010), the evidence provided has been sufficient for policies to endorse the provision of IPT for patients stabilised on ART. This is also consistent with the finding that even in those with viral load suppression on ART, TB incidence remains higher than in the general population (Lawn et al., 2011). Although there is evidence that prolonged IPT (36 Months) may be superior to 6 months of IPT (Samandari et al., 2011) the South African guidelines recommend 6 months; probably a realistic goal given the current low coverage of even 6 months of preventive treatment. Task shifting can be used to scale up this intervention as it has been shown that IPT can be

delivered by nurses using clinical criteria for adverse event monitoring (Grant, Mngadi, van Halsema, Luttig & Fielding 2010).

Many of the cited barriers to IPT are being overcome and there is a growing body of evidence to show that IPT does not cause subsequent resistance to INH (Samandari et al.,2011; van Halsema et al., 2010). However, a new barrier may be emerging as there is growing evidence of PLWH having asymptomatic, culture positive TB (Oni et al., 2011 ; Bassett et al.,2010; Lawn et al., 2011) this may require a revision of criteria for excluding TB as many of these patients also tested negative on Xpert MTB/RIF and/or had a normal chest-Xray (Oni et al., 2011 ; Bassett et al.,2010 ; Lawn et al., 2011).

The third I in TB prevention is ***TB infection control.*** The WHO released the "Guidelines for the prevention of TB in healthcare facilities in resource limited settings" as early as 1999 (WHO, 1999); these guidelines were revised in 2009 (WHO, 2009) but have had little impact on practice (WHO, 2011). Data from 2010 show that among the 149 low and middle-income countries from which data on infection control were requested, 34 (23%) had conducted a national assessment of infection control for TB, and 45 (30%) had a national plan for infection control. Training related to infection control was implemented in 78 (52%) of these countries in 2010 and 79 had a focal point for infection control in at least one tertiary hospital (WHO 2011).

To provide a proxy measurement to assess TB infection control, the WHO developed the indicator of "TB notification rate ratio of health-care workers over the general population" to monitor infection control, but data is not available globally or for South Africa (WHO, 2011). WHO is currently leading the development of guidance material regarding how to establish surveillance of TB among health-care workers (WHO 2011).

In South Africa, nosocomial TB transmission was highlighted in the Tugela Ferry outbreak in South Africa (Gandhi et al.,2006) with high death rates in what was later to be defined as extensively drug-resistant TB (XDR-TB) co-infected patients. South Africa

released the National TB Infection Control Guidelines in 2007 (South African National Department of Health, 2007) based on those of the WHO (WHO, 2009) which clearly outline administrative, environmental and personal protection controls. However, implementation of these guidelines remains poor.

Decreasing the burden of HIV in TB patients

To decrease the burden of HIV in TB patients, the WHO guidelines promote HIV counselling and testing (HCT) and HIV prevention methods for all TB patients, and cotrimoxazole preventive therapy (CPT) and HIV/AIDS care and support including antiretroviral treatment (ART) for those who are co infected with TB and HIV (Stop TB Department and Department of HIV / AIDS, 2004).

The WHO reports great progress in scaling up ***HIV testing***. Globally 1 million TB patients (16%) knew their HIV status in 2007, 15% were HIV positive. Testing increased to 34% globally in 2010; of which 23% were HIV positive. This increase was also seen in South Africa where 39% of TB patients knew their HIV status in 2009 (73% HIV positive) (WHO 2009) and 54% of TB patients knew their HIV status (60% HIV positive) in 2010 (WHO, 2011).

The ***HIV prevention*** methods outlined in the 2004 guideline include promoting safer and more responsible sexual behaviour and practices, delayed onset of sexual activity, reduced number of sexual partners, systematic use of condoms (male and female) and diagnosis and treatment of other sexually transmitted infections (South African National Department of Health, 2004). Reduction of parenteral HIV transmission and vertical transmission to infants is also emphasised. No data on HIV prevention in the context of TB care is reported by the WHO (WHO 2011).

Cotrimoxazole Preventive Therapy (CPT) is known to be effective in reducing mortality in PLWH (Wiktor et al., 1999 ; Nunn et al., 2008) and concerns regarding toxicity and

resistance have been addressed (Harries et al., 2009). The WHO recommendation for resource-limited settings recognises the benefit of CPT in reducing disease from malaria, bacterial infection and diarrhoea and recommends CPT for PLWH with CD4 <350 cells/mm^3 (Sesay et al., 2006) . Recent data from South Africa, a setting with minimal malaria and high rates of co-trimoxazole resistant bacteria, demonstrated a 36% reduction in mortality with CPT when used with ART (Hoffmann et al., 2010).

Despite the known benefits of CPT, coverage is not optimal. In 2007, 0.2 million (72%) of TB patients received CPT, a small proportion of the 1.4 million estimated PLWH (WHO 2009). In South Africa data was comparable with 5080 (67%) co-infected patients receiving CPT. In 2010 these numbers increased to almost 80% globally and 74% in South Africa (WHO, 2011b).

The fourth intervention described for decreasing the burden of HIV in TB patients is to ***ensure HIV/AIDS care and support***. This includes clinical management, prophylaxis, early diagnosis, rational treatment and follow-up care for opportunistic infections. Importantly, PLWH who complete TB treatment should be provided with a continuum of care and support for HIV/AIDS that should be facilitated by a client referral system. Although no specific indictors for this fourth intervention are available; the issue of appropriate referral is pertinent to this review; rigorous patient level data collection and sharing between the TB and HIV programmes is essential to fulfil this requirement.

The fifth and final intervention to decrease the burden of HIV in TB patients is initiation of ***Antiretroviral treatment***, recognising that ART can substantially improve outcomes in TB patients (Harries et al., 2009). Despite this, ART coverage has been low. In 2007, only 0.1 million (34%) received ART globally; 2456 (34%) on ART in South Africa (WHO, 2009). This increased significantly in 2010 where almost 80% of eligible patients were on ART and in South Africa, 54% of TB patients were receiving ART (WHO, 2011).

The latest WHO guidelines recommend ART for all TB patients, regardless of CD4 cell count (WHO, 2010). In South Africa, ART is recommended for TB patients with CD4<350 cells/mm^3, to be initiated within 2-8 weeks of TB treatment initiation (South African National Department of Health, 2010). Two randomized controlled trials have shown that AIDS-free survival is higher with early ART versus delayed ART for patients on TB treatment but this is only significant for patients with CD4 <50 cells/mm^3 (Abdool Karim et al., 2011; Havlir et al., 2011). The cumulative lifetime risk of TB in HIV-infected individuals is a function of time spent at various CD4-defined levels of risk, both before and during ART (Lawn et al., 2011). Once again early diagnosis of HIV and transition into optimal care is essential to maximize the potential of ART to influence the TB epidemic.

In addition to exploring the individual elements of TB/HIV integration as described above; a number of studies have been undertaken in various settings to explore the challenges of TB/HIV integration.

Overview of TB/HIV integration

TB/HIV integration in South Africa

The general challenges of TB/HIV integration in South Africa have been described by a number of authors as summarised below.

The most recent paper by ***Loveday & Zweigenthal*** (Loveday & Zweigenthal, 2011) sets out to identify key obstacles and propose solutions to TB/HIV integration in a health systems research case study. The authors used peer-reviewed and grey literature and their own experience to identify key obstacles to integration. They reviewed legislation, policies and guidelines to determine whether these facilitate or undermine attempts at integration.

Limitations of the paper include that the process of reviewing the literature is not described or evident in the paper and the incorporation of the author's experience and

opinion may bias the findings. However, the points raised were useful in outlining some of the broader issues which may hinder TB/HIV integration efforts. Examples include the history of political denial around HIV in South Africa which gave rise to the first HIV treatment programmes being provided by Non-governmental organizations (NGOs), in a parallel system. This parallel system was entrenched by subsequent ring-fenced HIV funding once ART was introduced into the public sector. In addition, staff were encouraged to continue providing either HIV or TB care. This is particularly evident among the Community Health Workers (CHWs) with different cadres providing TB care ("DOTs supporters") and HIV care ("Home-based carers") who are remunerated differently.

The authors also outline the conflicting principles which underlie the two programmes; ART adherence emphasises patient empowerment whereas the DOTs TB strategy promotes paternalism and policing. This is one of only two papers published on the challenges of TB/HIV integration, the other being by ***Harries et al*** (Harries et al., 2009), which highlights the problem of monitoring and evaluation. The principle challenges raised are that too much data is being collected, on multiple paper-based cohort data systems with two sets of patient's notes, often stored in different parts of the clinic.

The solutions of policy change and health system reform proposed in this paper are valid, although they may be optimistic. However, the recommendation that all cadres of CHWs be combined and trained to provide both TB and HIV care have come to fruition in the new Department of Health Primary Health Care Reengineering Plan (South African National Department of Health, 2011).

Perumal et al (Perumal et al., 2009) published a debate which identified similar "high level" problems such as parallel, mutually disconnected systems. As a "debate", once again, the authors used their experience to identify problems and their opinion was based on their experience; making it similar to that of Loveday & Zweigenthal (Loveday & Zweigenthal, 2011). However, this paper did refer to some validated methods to improve specific

interventions such as Provider Initiated HIV testing (PIT) in TB services, point of care CD4 testing, ART and IPT. Key missed opportunities identified were counselling and testing, surveillance for both TB and HIV at every opportunity, adherence support, infection control and positive prevention.

The paper could have been even stronger if all the available scientific evidence for the abovementioned approaches was incorporated to provide a more compelling argument for their implementation.

In 2007, Dong et al (Dong et al., 2007) discussed the challenges of TB and ART delivery, once again within two separate and parallel systems. However, this paper specifically focussed on ART and TB treatment adherence support, using the experience of the integration of TB in Education and Care for HIV/AIDS (iTEACH) program in KwaZulu Natal, the province in South Africa with the highest HIV prevalence.

The programme is well described and the lessons learned and recommendations for ongoing HIV and TB adherence support were based on programme experience. Recommendations included the need for effective TB/HIV reference tools and training for care providers, individualised adherence counselling and take home materials in the patient's local language, the need for a multi-disciplinary approach and incorporation of traditional healers and community support to improve adherence.

The paper only referenced one similar programme in Kenya; the recommendations would have been stronger if other supporting literature was cited.

Notably lacking in the above-mentioned three papers is the lack of data at clinic level. ***Scott et al*** (Scott et al., 2010) recognised the challenges of translating policies into action and set out to determine how middle managers could be empowered to monitor the implementation of effective integrated TB/HIV services at the primary health care level. A participatory assessment tool was collaboratively designed with managers. This tool

measured implementation of over 50 indicators, including access, availability and capacity, quality, continuity and integration of HIV, TB and STI care.

The assessment was performed using 635 clinic records at 16 clinics over a two day period. Weaknesses in training, quality and continuity of patient care were identified. The impact of the assessment results was that managers compiled action plans to address weaknesses at their facilities. Findings were well described and the study included relevant peer-reviewed literature which assisted in comparisons and strengthened recommendations. Although this study, conducted in 2006, represented a useful first step in assessing TB/HIV integration at facility level, it was a rapid assessment of only 12% of facilities in the urban Cape Town metropole. Only facilities which indicated that they would be open to an evaluation process were considered for the assessment; introducing selection bias. Although the paper gave a data-driven overview of some key indicators at clinic level, it did not present data at the individual patient level; thus the efficacy of TB/HIV integration on individuals could not be assessed.

The only published paper found in the literature review which looked at primary health care facility level patient data in South Africa was published by ***Coetzee et al*** in 2004 (Coetzee et al., 2004) using 2001-2002 health information system and clinical data. This study was done prior to the release of international or national guidelines on TB/HIV integration with the view to assessing whether TB/HIV integration would be beneficial. It was conducted in the context of an entrenched national TB programme and a donor-funded HIV programme which was in the pilot phase as the SA DOH had not yet initiated ART roll-out in the public sector. Although the findings of the study may now appear self-evident, the authors showed forward thinking in using the available literature on effective combined TB/HIV interventions to assess how to provide more effective patient care. The paper is a good example of use of patient level, facility data to give a comprehensive picture of the

challenges of TB/HIV integration and the potential benefits to individual patients of improved TB/HIV integration.

One paper was found which directly addressed the issue of TB and HIV data collection in South Africa. In 2007, ***Heunis et al*** (Heunis et al., 2011) reviewed the accuracy of routinely collected data and interviewed nurses to obtain their views on the information systems in the Free State, one of the nine provinces of South Africa. Data from 20 facilities across the province which represented a cross-section of facilities by urban/rural mix and clinic size was reviewed.

Over 2800 data entries were assessed and an inconsistency rate of 21% was found between facility data and that recorded at provincial level. Despite this, the nurse managers reported using the data for decision-making. On the one hand this is reassuring in that managers recognized the need for data-driven decision-making; on the other, the inaccuracy of the data which would guide decisions is clearly a concern. The primary recommendation of the interviewed nurses was for an integrated TB/HIV system.

Although this was a small study, limited to one province, it was a credible attempt to quantify the extent of data inaccuracy and the need for a comprehensive review of data collection and collation methods both for TB and HIV to inform management decisions.

TB/HIV integration in Sub-Saharan Africa

Moving further afield, three papers have been published in the last four years which describe the overall challenges of TB/HIV integration in Sub-Saharan Africa; including South Africa.

The most recent paper by ***Howard and El-Sadr*** (Howard & El-Sadr, 2010) provides an overview of the feasibility of TB/HIV integration activities, focussing on the author's experience of supporting programmes which implement ICF, IPT, Infection control, ART and nutrition interventions, and integrated programmes. The exact programmes and their

locations were not described which makes it difficult to contextualise and compare the findings with those of other studies. The authors make good use of existing literature to support their recommendations and some of their findings. For example, the use of a TB symptom screen is well-substantiated by data from the programmes they support. However, the bulk of the article re-iterates issues around TB/HIV integration which have been elucidated in other publications with little new data.

In 2009, ***Harries et* al** (Harries et al., 2009) published a perspective on HIV care for co-infected TB patients. This is an outstanding article in that it combined proven interventions with clinical guidelines to synthesise the body of knowledge at the time. The authors recognised the need to focus on implementation of effective interventions in the context of clinical and programmatic challenges of combining ART and TB treatment.

With 70 references, scientists and clinicians alike could use this article as a reference point for the "state of the ART" in TB/HIV integration at that time. The article clarified which interventions were proven and should be implemented (PICT, CPT, IPT, ART) and which questions still required clarity, e.g. optimal timing of ART initiation and optimal ART regimens for co-infected patients.

In 2007, ***Friedland et al*** (Friedland, Harries, & Coetzee, 2007) described experience in TB/HIV integration in a site in Malawi and two sites in South Africa, in Kwa-Zulu Natal (DOH Clinic) and Khayelitsha (NGO clinic) in the Western Cape. The Khayelitsha site was the same site describe by Coetzee et al. (Coetzee et al., 2004). The comparison of these geographically and programmatically distinct experiences was helpful in that it outlined different strategies which may all be effective. Similar to the article by Howard & El Sadr (Howard & El-Sadr, 2010), data was limited but the description of three distinct services, as opposed to the generalisations presented by Howard & El Sadr, do help the reader to contextualise the findings and may be useful at clinic level.

TB/HIV integration internationally

At an international level, ***Fenner et al*** (Fenner et al., 2011) described TB-related practises in ART programmes in lower–income countries using a standardised electronic questionnaire-based survey conducted in 2008. In addition, risk factors for TB in the first year of ART were identified. Fifteen ART programmes in 12 countries in Africa, South America and Asia, and members of the ART in Lower Income Countries (ART-LINC) collaboration of the International Epidemiological Databases to Evaluate AIDS (IeDEA) were included.

Although the paper set out to describe approaches to TB prevention, only IPT provision is described. TB symptom screening as part of ICF and TB infection control are not mentioned. The article focusses on the provision of TB diagnostics such as sputum microscopy, TB culture and chest x-ray within the ART programmes. Although it justifiably might be argued that it was not the intention of the paper to comprehensively cover all aspects of TB/HIV integration, focussing on only IPT and diagnostics for TB, does not take into account the comprehensive approach advocated by WHO. The discussion on effective screening strategies which moves directly to diagnostics does not take into account the latest WHO recommendations on ICF (Stop TB Department and Department of HIV/AIDS, 2011). However, the article does mention the latest challenge in TB ICF; pointing to the latest trend towards higher TB incidence according to availability of diagnostics.

In contrast to all the articles described above which related the challenges of TB/HIV integration in lower-income countries***, Gadowski et al*** (Gadkowski et al., 2009) described a retrospective cohort of TB/HIV infected cases reported in North Carolina between 1993-2003. In contrast to most programmes in lower-income countries, comprehensive surveillance data was available for 5332 TB cases, 553 (10%) of which had known HIV infection. The data are clearly presented and thoroughly analysed and demonstrates the

tremendous benefit of accurately documented routine data to inform improved monitoring and evaluation, and improved patient care.

The findings of the study showed low utilisation of HIV care prior to TB diagnosis with low ART initiation in co-infected patients and high mortality as a result; similar to findings in lower-income countries (Fenner et al., 2011). Although this finding may initially be surprising, the authors make the point that many co-infected patients in North America may also fail to access appropriate health care in the public health system; not unlike co-infected patients in lower-income countries (Larson, Brennan, Mcnamara, Long, & Rosen, 2010).

Having reviewed the available literature in the context of local and international guidelines, it became apparent that there is no recent published operational research documenting the coverage of the different components of TB/HIV activities in Sub-Saharan Africa in primary health care facilities using patient- level data.

In South Africa, HIV facility level data are generally collected on a paper based system which may include standardised registers. The facilities are then asked to collate data and present summary reports at sub-district level. This is collated and presented to the district and then to the province. In the case of TB data, a parallel process occurs whereby the data from the standardised “TB case identification” register is entered electronically at a district level and then submitted to the province. Facilities have varying staffing levels, access to sub-district data and results from facility to provincial level are often disparate; resulting in frustration both for the facility, the province and finally errors exist at the National level.

Data provided by WHO is aggregated at country level and reflects the challenges related to poor reporting and the complexity of sharing data between two vertical programmes (Gunneberg et al., 2008).

Although aggregated data may be useful for assessing trends, it does not give patient-level information which makes it impossible to assess the quality of care individual

patients are receiving and where interventions should be targeted. In addition, facilities seldom receive feedback on their collated data; making data-driven improvement impossible.

We collated routinely collected HIV and TB facility level data to better understand the success and challenges of TB/ HIV integration at the primary health care facility level at three clinics in urban Johannesburg, South Africa.

Addendum #2: Discussion

The results of this quantitative evaluation represent the gravity of the TB/HIV epidemic in South Africa, with at least 90% of TB patients living with HIV and median CD4 count of 131 cells/mm^3 (IQR: 60-235) at presentation.

HIV care for TB patients appeared to be superior to TB screening in HIV patients; findings comparable to a similar setting in Cape Town, South Africa (Scott et al., 2010). Successes include reasonable rates of HIV testing among TB patients and high rates of CD4 testing for known HIV positive TB suspects and patients. Missed opportunities for PLWH included poor documentation of TB symptom screening at HCT, low rates of TB diagnostic screening for symptomatic PLWH, no IPT implementation and inadequate infection control. Further, poor rates of TB treatment initiation and poor documentation of CPT and ART were missed opportunities for TB patients.

Decreasing the burden of TB in People Living with HIV

The 1104 ***HCT c***lients were young (median age 27 years) and predominantly female (75%), thought to be representative of young women who present to the clinic for contraceptive or ante-natal care. Three hundred and six (28%) were HIV-positive, which compares with the 30.2% South African Ante-natal prevalence data in 2010 (South Africa National Department of Health, 2010) (Table 5).

Neither HIV positive or negative patients at HCT were routinely offered TB symptom screening. Actual symptom screening performed may be vastly underestimated as health-care workers may only document findings they consider important or on which they plan to act. However one would expect a proportion greater than 0.6% of HIV positive HCT clients to be assessed by smear microscopy if this were the case.

It has been found that standardised documentation of a simple TB symptom screen at each patient visit has been shown to be feasible in a similar setting (Howard & El-Sadr, 2010). Using this symptom screen, 22% of newly enrolled persons with HIV or AIDS were symptomatic and 12% received a diagnosis of TB (Howard & El-Sadr, 2010). A TB symptom screen for current cough, fever, weight loss or night sweats not only facilitates intensified TB case finding, but also guides eligibility for IPT (Getahun et al., 2011 ; Stop TB Department and Department of HIV/AIDS, 2011). There was no referral of asymptomatic patients for IPT from HCT, representing a missed opportunity.

Only 57% of patients found to be HIV positive at HCT had a CD4 recorded; the median CD4 count was 336 cells/mm^3 (Table 5). This was higher than the median CD4 count of 111 cells/mm^3 recorded in four large ART cohorts in sub-Saharan Africa (May et al., 2010). Strengthening pre-ART programmes could thus provide an excellent opportunity to improve TB/HIV prevention efforts. In addition, recent publications suggest that Point of Care CD4 testing at HCT may be a practical approach to increase the number of diagnosed patients who initiate HIV care (Faal, Naidoo, Glencross, Venter,& Osih, 2011) ; (Larson et al., 2010). Pre-ART programmes thus provide an excellent opportunity for HIV and TB prevention efforts and also ensure that patients commence ART as soon as they are eligible.

In contrast to the paper-based recording of HCT, we recorded information on clinic visits among people known to be HIV-infected was recorded electronically. Of the 6157 clinic encounters the majority (79%) were for patients on ART.

The presence or absence of TB symptoms was part of routine clinical history data, recorded for all clinic encounters with PLWH, resulting in all PLWH having a record of TB symptoms. However, the symptoms were not collected as part of a TB screening assessment but rather as part of the clinical assessment. This may be one reason why health care workers rarely acted upon the presence or absence of TB symptoms.

The proportion of individuals with any ***recorded TB symptom o***f any duration was slightly higher for pre-ART than ART visits (17% vs. 14%, p=0.04). In both populations, cough was the most frequently recorded symptom (85% and 70%), a finding in keeping with the majority of studies (Getahun et al., 2011).

Of the 921 clinic encounters with TB symptoms documented, only 91 (10%) resulted in sputum being collected, with similar proportions of pre-ART and ART suspects being investigated (12% and 9%, respectively, p=0.20). This was clearly a missed opportunity, considering that 17 (19%) of those investigated were found to have TB.

IPT was not provided in these clinics. At the time of this study, local guidelines for adult IPT recommended that PLWH with no signs and symptoms of TB, no contraindications and a positive tuberculin skin test (TST) or a pulmonary TB contact were eligible for IPT. TB preventive therapy was not recommended for patients already on ART or for those with TB in the past two years (South African National Department of Health, 2008). Taking into account the logistical barriers to TST testing, the latest South African IPT guidelines do not require a tuberculin skin test and previous TB is no longer a contraindication. South African guidelines are unclear regarding IPT and ART; the IPT guidelines make a conditional recommendation of IPT for patients already on ART (South African National Department of Health, 2010) however the South African ART guidelines do not recommend IPT once on ART (South African National Department of Health, 2010). This seems counter to the growing evidence that the benefit of IPT and ART are additive (Samandari et al., 2011 ; Golub et al., 2009 ; (Charalambous et al., 2010) and supports the need for revised guidelines.

Implementation of ***TB infection control*** was poor, reflecting the situation in South Africa with lack of information and training on existing guidelines. HCW and administrators alike are often pre-occupied with environmental controls and personal protective equipment rather than on the more practical administrative controls. At the three study sites there was

no system for consistent monitoring of infection control and infection control plans, and site assessments as advocated by the guidelines (South African National Department of Health, 2007) are inconsistently implemented. The initiation of systematic documentation and reporting of staff members who develop TB needs to be implemented to understand the situation in South Africa, and to allow countries to report numbers of staff members with TB as required by the WHO (WHO, 2011) to monitor infection control.

Decreasing the burden of HIV in TB patients

Similar to global trends, the coverage of activities to reduce the burden of HIV among people with TB was higher than the coverage of the 3I's.

29% of ***TB suspects knew their HIV status*** at time of presentation. Suspicion of TB prompted HIV testing with 54% of TB suspects knowing their HIV status by the end of the diagnostic process, this opportunity was partially used. Of the TB suspects who knew their status, 73% were HIV infected. This high prevalence of HIV in TB suspects is similar to other settings in South Africa, 73% (Shah et al., 2011); Kenya 62% (Odhiambo et al., 2008) and Malawi 56% (Munthali et al., 2006) and supports the expansion of PICT recommendations to include TB suspects in addition to TB patients, which is the current recommendation. This will require revision of the current TB Case identification and follow up register which does not have a data field for HIV status; many clinics currently add a column to record HIV status on the paper register.

Among the 602 TB suspects, 143 (24%) were ***diagnosed*** with active TB: 80 (56%) with smear positive TB, 25 (17%) with smear negative, culture positive TB, 27 (19%) based on clinical and/or radiological criteria and 11 (8%) with extra pulmonary TB (Table 6).

A culture was requested in the majority (70%) of smear negative TB suspects but the results was missing in 17%, representing not only a missed opportunity but a waste of resources. This waste of resources has been documented elsewhere (Stall et al., 2011).

The Xpert MTB/RIF PCR diagnostic has been used effectively in low-resource settings to simplify patients' access to early and accurate diagnosis (Boehme et al., 2011) and this may result in less waste.

Not all smear positive (81%) and only 26% of smear negative, culture positive patients initiated TB treatment.This high rate of initial default has been found in other settings in South Africa (Botha et al., 2008), Pakistan (Rao, Anwer & Saleem, 2009) and Malawi (Squire et al., 2005) and has been attributed to poor quality of health services (Botha et al., 2008) and a diagnostic process which is not responsive to patient's needs (Squire et al., 2005). Point of care diagnostics and an electronic patient monitoring system with the ability to alert clinicians to missing results and results which need to be acted on which should facilitate clinical care and follow up.

75% of ***TB patients*** knew their status after TB treatment initiation which is relatively high, but many programs have shown that 84% is achievable (Harries et al., 2011) (Table 7). Diagnosis of TB provides an important entry point for HIV care and is an opportunity that should not be missed (De Cock, Mbori-Ngacha & Marum, 2002; Wood, 2007; Perumal et al., 2009). Provider initiated HIV testing has been shown to be acceptable by TB suspects and TB patients (Odhiambo et al., 2008; Corneli et al., 2008 ; Levin L, Irving K, Dikgang M, Punwasi J, Isaacs M, 2006) and staff (Corneli et al., 2008) and is an opportunity that should be exploited. In addition PICT at TB diagnosis has been shown to increase patient's access to ART (Lawn et al., 2011).

The finding that 90% of TB patients are HIV positive highlights the need to test and stage all TB patients. Although the majority (88%) had a CD4 count measured, and 87% would have been eligible for ART using the CD4 <350 cells/mm^3, there was very poor documentation of ART in the TB clinic files. The lack of consistent reporting of ART status reflects the negative consequences of a vertical system approach and underscores the lack of integration between primary care services and ART services, even within one facility**.**

There was no documentation of HIV prevention counselling for either HIV positive or HIV negative TB patients although this may have taken place without being documented. Cotrimoxazole Preventive Therapy was not consistently documented although HCWs reported using CPT. However, lack of documentation is of concern as it is unlikely that patients were consistently receiving this proven intervention.

Despite a concerted effort to retrieve ***patient information*** from all available routine sources, a significant amount of data on TB/HIV indicators were missing. There is clearly a need for improved record keeping, not just for patient-level data but also for integrated TB/HIV data. Consideration needs to be given to the implementation of appropriate electronic medical records which have been shown to be more complete, and allow for rapid feedback to support indicated services and retention of care in similar settings (Fraser et al., 2005). Integrated electronic medical records will also contribute to National and global data collection, analysis and use (Gunneberg et al., 2008).

Table 5: HIV and CD4 results among 1104 clients presenting for HIV Counselling and Testing registered at three primary care clinics in Johannesburg, South Africa

	(n) %
Median age, years	27
Sex	
Females	830 (75)
Males	274 (25)
HIV test results	
Positive	306 (28)
Negative	789 (71)
Missing/Pending	9 (1)
CD4 results	
% HIV positive with CD4 results	174 (57)
Median CD4 (cells/mm^3)	336

Table 6: TB diagnosis and TB treatment initiation among 602 TB suspects registered at three primary care clinics in Johannesburg, South Africa

	n (%)	n (%)
Median age, years	36	
Sex		
Females	317 (53)	
Males	285 (47)	
TB diagnosis	143 (24)	**TB treatment initiated**
Smear positive	80 (56)	65 (81)
Smear negative, culture positive	25 (17)	7 (26)
Clinical and radiological criteria	27 (19)	27 (100)
Extrapulmonary TB	11 (8)	11 (100)

Table 7: HIV counselling and testing status among 208 TB patients registered at three primary care clinics in Johannesburg, South Africa

	n (%)
Median age, years	36
Sex	
Females	102 (49)
Males	106 (51)
Type of TB	
Pulmonary	168 (81)
Extrapulmonary TB	38 (18)
Missing records	2 (1)
Known HIV status	
Before TB diagnosis	81 (39)
At time of TB treatment initiation	147 (66)
During TB treatment	155 (75)
CD4 results	
% HIV positive with CD4 results	122 (88)
Median CD4 (cells/mm^3)	131

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